

What can be learned from the 3–4 September 2013 Global Hawk flight into Developing Gabrielle and Disturbance 'Dent'?



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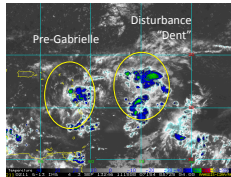
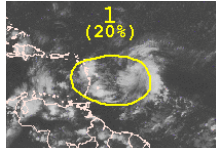


PRE-GABRIELLE (P25L)

Pre-Gabrielle (left side of poster) & "Dent" (right side)

THIS COLOR BOX FOR DISTURBANCE-RELATED RESULTS
P25L (pre-Gabrielle) and P30L (Disturbance "Dent") were both investigated in the 3-4 September AV-1 flight. While both were located in apparently favorable environments, the NHC placed a "low" chance of formation. P30L appeared to be the more promising of the two.

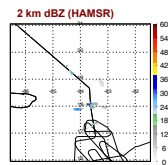
THIS COLOR BOX FOR FLIGHT PLANNING LESSONS LEARNED
This flight was a follow-up to an AV-6 flight into P25L (pre-Gabrielle) on 29-30 August. Earlier attempts to sample the disturbance using AV-1 were cancelled due to aircraft issues.



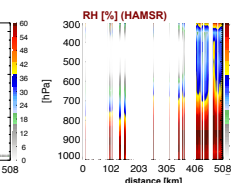
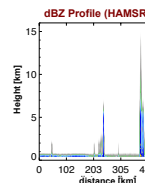
9/3: 1548 – 1645 UTC

Relative humidity on the inbound leg to pre-Gabrielle indicates substantial midlevel (700-400 hPa) dry air in close proximity (approximately 100 km) to the northern part of pre-Gabrielle. Humidity above 700 hPa increases significantly within 100 km.

There was difficulty planning the initial convective module (lawnmower) as mission science was informed that a 15 nm clearance from the islands was required. This led to a delay in getting the plan to the pilots.

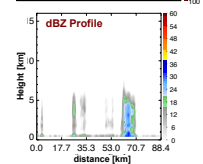
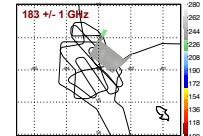


Transit to Pre-Gabrielle

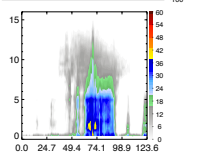
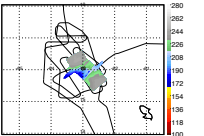


2nd Lawnmower Pattern

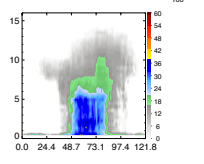
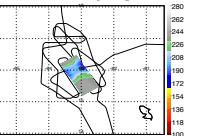
2147 – 2157 UTC



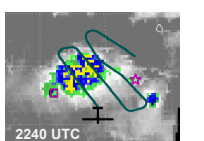
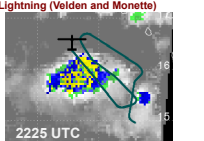
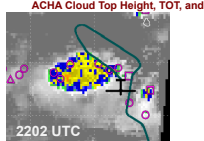
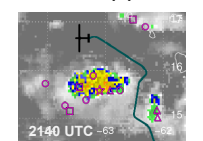
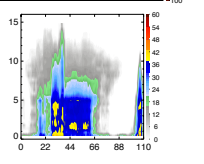
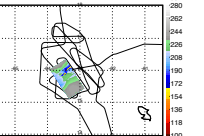
2201 – 2215 UTC



2221 – 2234 UTC



2239 – 2251 UTC



Cloud Height in Pressure Altitude Coordinates (kt)
 5 KsTOT<7 K Δ 7 KsTOT<9 K □ 9 KsTOT<11 K ☆ TOT≥11 K
 ♦: 0-5 mins. old lightning ♦: 5-15 mins. old lightning

- Due to in part diversions for convective tops, little organized precipitation was observed during the initial lawnmower pattern. Only isolated, weaker convective cells were observed (max. 20 dBZ heights are typically below 8 km).
- The diversions, however, were necessary as ACHA cloud top heights in more significant convective areas were 50-52 kft (aircraft altitude was 53 kft).
- An organized MCS was observed later (~2.5 hrs after initial pattern ended) during the 2nd lawnmower as there appears to be a leading convective line (northern part of the MCS) with trailing stratiform (southern).
- The convection appears to weaken while the pattern is flown, however the only evidence is from the lower cloud top heights observed in the ACHA product.

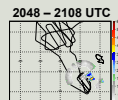
Successes:

- Sampled the spatial characteristics of an MCS during the pregenesis stage of developing Gabrielle

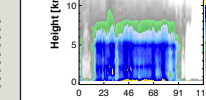
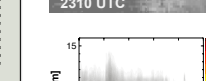
Improvements:

- Too many turns. If deviations are not necessary, need to avoid turns during important legs through precipitation.
- Extend legs. The module in southern pre-Gabrielle (right) likely would have benefited from extended legs so as to avoid turning while still sampling the targeted precipitation region.
- Repeat patterns. While 2 lawnmower patterns were able to sample the spatial characteristics of precipitation, the time evolution was not well sampled in sample.
- Should flying in this region be attempted? While this certainly was an important flight, the location between the Lesser Antilles (must maintain 15 nm separation from land) and outwaded Venezuelan airspace made it difficult to plan and execute efficient, and useful, sampling.

2023 – 2048 UTC

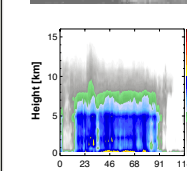
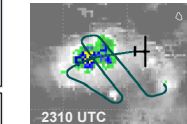


2048 – 2108 UTC



Pre-Gabrielle Exit Leg

2305 – 2321 UTC

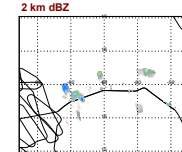


DISTURBANCE "DENT" (P30L)

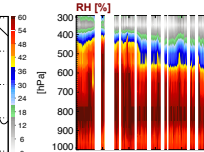
9/3: 2322 – 9/4: 0005 UTC

Very little precipitation observed between pre-Gabrielle and "Dent". Unlike to the north of the disturbances, high humidity through middle troposphere (up to 500 hPa) along entire transit.

Although a more direct route may be preferred (less turns), this leg effectively sampled the environment between the two disturbances.



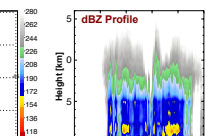
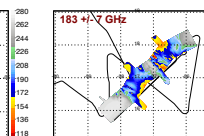
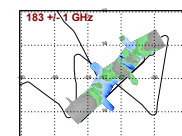
Transit to Disturbance "Dent"



9/4: 0012 – 0053 UTC

This leg flown on the northern periphery of the convective burst. Predominantly stratiform precipitation.

Deviations made for convective tops to the south of the flight track. Convection was weakening (see below).

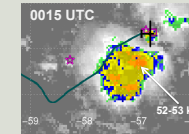
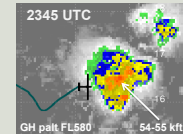


Was the deviation necessary?

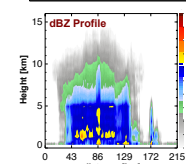
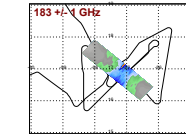
Aircraft should maintain at least 5000 ft vertical separation from significant convective cloud tops except: (a) when cloud tops above FL500. Do not approach significant lightning activity or significant overshooting tops within 25 nm.

- While the indicated cloud heights are around 54-55 kft, no TOTs or aircraft at a pressure altitude of 58 kft lightning detected.
- Borderline separation of 5000 ft as are around 54-55 kft, no TOTs or aircraft at a pressure altitude of 58 kft lightning detected.

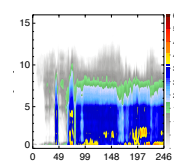
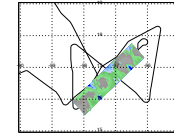
Given that the convection is weakening, the deviation was likely not necessary, however due to the satellite latency, this information was not known in real time.



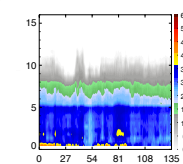
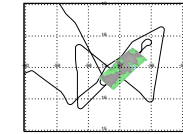
0127 – 0151 UTC



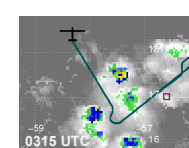
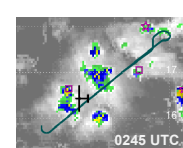
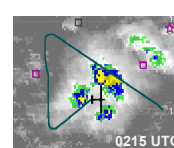
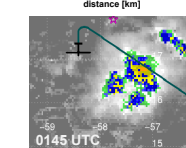
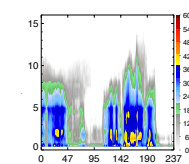
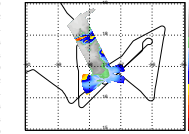
0217 – 0246 UTC



0259 – 0314 UTC

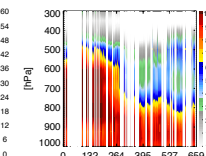
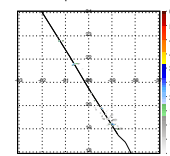


0316 – 0339 UTC



0343 – 0450 UTC Transit North of "Dent"

Humidity on this leg is ~20-30% greater at midlevels than the leg flown in transit to pre-Gabrielle to the west.



Over the nearly 2 hours spent in the repeated figure-4 pattern, precipitation dissipated into primarily stratiform rainfall. The only active deep convection was observed around 0335 UTC on the northward outbound leg from "Dent".

While no organized MCV was obvious in subsequent satellite images, this observation should be verified in wind retrievals from HIWRAP.

Successes:

- Repeated pattern = clearer interpretation of the evolution of precipitation field. If a vortex is present, the evolution and relationship of the vortex to the precipitation can more readily be investigated with the repeated pattern.
- Very few deviations around significant convective tops were necessary.
- Straight legs (NO TURNS)

Improvements:

- More time in pattern, particularly earlier in the lifecycle.
- Can "borderline" deviations be avoided?